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/u/-Fronting is not Monolithic: Two Types of Fronted /u/ in Houston Anglos

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Abstract

Houston Anglos of all ages show advanced degrees of /u/-fronting. However, a close acoustic analysis of the fronted /u/ of younger and older Anglo Houstonians reveals two distinct types: a more monophthongal type, consistent with prior descriptions of fronted /u/ in the rural South, and a more diphthongal type, consistent with descriptions of /u/-fronting in non-Southern speakers. The two types differ in a number of fine temporal and spectral details. This provides an opportunity to test the hypothesis that the ongoing, supra-regional fronting of /u/ in North America represents an adoption of the older, Southern fronting pattern. Taken together with previous findings, the data presented in this paper argue against this view and for an analysis of /u/-fronting as independently innovated in the South and outside of the South. Judging by the data from Houston, today the traditional Southern type of fronting is being abandoned in the urban South in favor of the newer, regionally unmarked type. The paper explores the implications of these findings for sociophonetic studies of the urban South, speech perception studies, and the analysis of other cases of “shared” shifts.

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1 Introduction

Despite the large and growing body of work documenting the fronting of the vowel /u/ (GOOSE) in North America, one basic question about this sound change has so far not been addressed empirically: What is the relationship between today's supra-regional fronting of /u/, especially in the speech of Anglos (e.g., Labov et al. 2006:152–155), and /u/-fronting as traditionally found in Southern American English (e.g., Bailey 1997)? Specifically, does the former process represent an adoption of the latter? Are they, in this sense, the same shift?

What is clear is that fronted /u/ was first attested in Southern speakers, as early as the mid-1800s (Bailey 1997:263). A century later, the *Linguistic Atlas* research found it to be still largely a Southern feature (see Thomas' 2001 review). Since then, however, fronted /u/ has come to cover "90% of the North American continent" (Labov 2008:27). Given these facts, Thomas (2001:33) suggests that fronted /u/ "spilled out of the South" and spread northward and westward. If fronted /u/ is indeed a borrowed Southern feature, it may be justified to speak of a single shift.

There are some unresolved problems with this scenario, however. One concerns the linguistic conditioning of /u/-fronting. In the South, /u/ has overcome, at least to some degree, the ban on fronting before coda-/l/ which exists in all non-Southern varieties (e.g., Labov et al. 2006:152). If the Southern fronted /u/ was borrowed, why did geographic diffusion lead to the introduction of a new constraint rather than to further allophonic leveling? Perhaps the constraint was still in place around mid-century when /u/-fronting started to spread beyond the South. But even if that is true, why does the pre-/l/ constraint show no signs of weakening today even in those non-Southern dialects which have exceeded the South in the degree of fronting in other environments (Labov et al. 2006:153) and where /u/-fronting is an otherwise completed shift (e.g., Baranowski 2008)?

Another problem is that Southern speech lacks overt prestige in the eyes of non-Southerners (Preston 1997). This makes it a priori unlikely for a Southern feature to gain such wide currency so rapidly. While covertly prestigious Southern features may have an advantage (e.g., Eckert 1996), in non-Southern locales fronted /u/ appears to be a prestige variant spreading in a change-from-above fashion (Baranowski 2008; see also Labov 2001:169 on fronted /o/ in Philadelphia).

In view of these problems, an alternative scenario in which /u/-fronting was independently innovated in the South and outside of the South bears consideration. Distinct geographic and social origins would have allowed each fronting process to accrue its own linguistic and social history. Incompatible aspects of /u/-fronting in different areas today may be attributable to those histories. Crucially, one further consequence of this hypothesis is that the resulting fronted variants of /u/ may also show fine phonetic differences reflecting their independent origins.

This paper discusses such phonetic differences and points to the second scenario as the more likely one. I begin by reviewing relevant prior phonetic descriptions of fronted /u/ (Section 2). Next, I present sociophonetic data from Houston, where recent demographic changes have caused Anglos to abandon many Southern phonological variants in favor of non-Southern variants. A case in point are two phonetically distinct types of fronted /u/. The two types found in Houston match prior descriptions of /u/-fronting in the South and outside the South, respectively (Section 3). The contrasts between them, taken together with earlier findings, argue against analyzing one as historically derived from the other (Section 4). Finally, I discuss the implications of these findings for three areas of inquiry: studies of /u/-fronting in the urban South, perception studies dealing with fronted /u/, and the analysis of similar 'shared' shifts (Section 5).

2 Previous Phonetic Descriptions of Fronted /u/

Starting with fronted /u/ in non-Southern speakers, the details of previous descriptions are strikingly similar. In all cases, it is the nucleus of /u/, i.e., its first articulatory target, that is primarily affected, while the offglide target remains close to /u/'s original high back position. As a result,

fronting entails strong diphthongization. Metcalf (1971:9) describes a common Los Angeles pronunciation as a “long *e*” followed by a “long *u*”, phonetically [iu]. Hinton et al. (1987:120) cite [iu] as an early advanced variant in California. Labov (2001:197) illustrates the progression of /u/-fronting in Philadelphia with the variants [ɰ], [ɰ̥], and [ɪ] in the word *moved*.¹ Ash’s (1996:12) spectrogram of a fronted /u/ in the word *two* spoken by an Iowa speaker makes it clear that the offglide target remains back. To the degree that the glide is affected, this seems to be a secondary effect. Hinton et al. note “frequent truncation of the offglide” (119) in California. Their examples all involve coronal codas, where the lack of an audible backglide can be attributed to place assimilation of the glide to the following consonant. This seems to be common, though not necessary, in advanced varieties. For example, Eckert (2008:29) notes pre-coronal glide deletion for the stereotypical California surfer pronunciation of *dude*, [dyd], but not for the Valley Girl style, where *food* is pronounced [fiwd]. Finally, as seen in these transcriptions, the fronted onset is often described as unrounded. However, the issue of rounding has so far not been addressed instrumentally.

Phonetic descriptions of fronted /u/ in the Southern states, specifically in the rural South, present a more complex picture. Starting with the front-back dimension, one well-documented feature concerns the direction of the offglide trajectory. In Southern speakers with advanced fronting, the glide target may be in front of the nucleus. For example, Thomas’ (2004) detailed account of contemporary rural Southern variants includes both slight backglides, e.g., from [ɣ] to [ɰ], and frontglides, e.g., [ɰ] to [ɣ]. Front-gliding /u/ was studied acoustically by Labov et al. (1972:135–144) for a group of Coastal North Carolina speakers. It is also illustrated by Labov et al. (2006:258) for a speaker from Birmingham, Alabama.

Less frequently discussed is the fact that fronted /u/ in the South involves only a limited amount of front-back movement, in fact sometimes none at all. An example is the variant [yy] mentioned by Thomas (2004). Even the diphthongal variants in Thomas’ summary mostly span less than one major degree of advancement. In the speech of Labov et al.’s (2006) featured speaker from Birmingham, the amount of upward movement far exceeds the amount of front-back movement. Typically, “the glide is entirely a matter of closure of height alone” (256). Kurath (1964:117), referring to a slightly earlier stage of /u/-fronting in the South, considered high central [ɰ: ~ ɰ̥] to be the most common Southern variants, both with no change in advancement.

A third unique aspect of fronted /u/ in the South, already seen in some of the variants cited here, is that fronting may go along with lowering of the nucleus. Strong lowering can be seen in several of Labov et al.’s (1972) North Carolina speakers and in Labov et al.’s (2006) emblematic Birmingham speaker. Lowering is also present in some, but not many, of the Southerners plotted in Thomas (2001). Still, according to Thomas’ (2004) summary at least some added upward movement is the norm in rural Southern Anglos.

To conclude this review, I briefly discuss one of Hall-Lew’s (2004, 2005) findings regarding back vowel fronting in Flagstaff, Arizona, which, as it turns out, foreshadows the Houston results. Hall-Lew (2004) finds the distribution of /u/-fronting in Flagstaff Anglos to be slightly irregular. Overall, /u/ shows a steadily advancing forward trend in apparent time, consistent with the timing of /u/-fronting in other Western states. However, some older rural males stand out by using a distinctly more fronted /u/ than their urban same-age peers. These speakers are either ranchers or positively oriented towards the local ranching culture. Hall-Lew attributes this finding to the Anglo settlement history of Northern Arizona. While more recent, urban immigration brought primarily Anglos from the West, especially from California, the first wave of Anglo settlers, starting in the 1880s and lasting through the Dust Bowl years of the 1930s, included rural migrant workers from Southern and Midwestern states, including Oklahoma. The ranchers’ fronted /u/, then, can be traced back to a historical rural Southern influence. It reflects the fact that /u/-fronting in the South was historically ahead of fronting elsewhere. In addition, and crucial for the present paper, Flagstaff Anglo /u/ also varies in another phonetic dimension. It appears to be “monophthongal for the rancher speakers, while ... diphthongal for the [urban] Western Shift speakers” (32, footnote 14). This subtle phonetic difference is consistent with the results which I turn to now.

¹I have converted Labov’s phonetic notation to current IPA throughout this paper.

3 Two Types of Fronted /u/ in Houston

3.1 Language Variation in the Houston Metropolitan Area

Although Houston is included in Labov et al.'s (2006) Southern dialect region, the results of recent fieldwork in the Houston metropolitan area (Gentry 2006, Pantos 2006) show that young Anglo Houstonians are at the forefront of the linguistic de-Southernization of the urban South. This well known trend is mentioned more often in connection with other large metros such as Atlanta or Dallas (e.g., Tillery and Bailey 2004:331). As in these cities, the post-WW2 influx of Anglo migrants from other states, accelerated in the 1970s by the Sunbelt migration (Thomas 1997), has fundamentally affected Houston's urban dialect. Large numbers of non-Southern Anglos moved to Houston in response to sustained economic growth, especially in the energy sector and subsidiary industries. Many settled in new suburbs and triggered a linguistic re-orientation in the following generations of native Anglos. The apparent-time record indicates that starting roughly with speakers born in the 1960s, urban Anglos increasingly failed to adopt traditional Southern phonological features. The resulting rural-urban split, which Thomas (1997) documented in Texas Anglos all across the state, is today being completed in Houston. Significantly, many young female Anglos do not merge pre-nasal /ɪ/ and /ɛ/, a hallmark of Southern speech and perhaps the only Southern phonological feature still found with some regularity among Houston Anglo teenagers (Pantos 2006). Some older speakers, however, clearly preserve Houston's Southern roots. For example, besides the PIN-PEN merger, Gentry (2006) found monophthongization of /aɪ/ and the 'rotation' of /eɪ/ and /ɛ/, indicating Stage 2 of the Southern Vowel Shift (Labov et al. 2006:127).

3.2 /u/-Fronting in Houston

Despite the great differences between the generations, Houston Anglos of all ages show advanced or in fact completed /u/-fronting. Young female speakers show the highest normalized F2 values overall, but their lead is not very large. Both the oldest and the youngest generation include speakers who make practically no allophonic distinction, in terms of the maximum F2, between /u/ after coronal and non-coronal onsets. This is often taken to indicate completion for this shift (e.g., Baranowski 2008, Fridland and Bartlett 2006; but see Section 5.1 below for problems with using the F2 peak). The only obvious point of difference is fronting before coda-/l/, which is variably present in older Anglos but absent in all others. Setting aside the problems posed by the pre-/l/ constraint (see Section 1), and assuming that /u/-fronting is indeed an essentially Southern feature, we might conclude that fronted /u/ in Houston constitutes a rare case in which a Southern phonological feature survived the demographic and linguistic transformations of recent decades.

The apparent continuity of fronted /u/ in Houston is called into question by clearly audible differences between the fronted /u/ of younger and older Anglo Houstonians. The contrast is evident not only before /l/ but also in other environments, especially where /u/ appears in word-final position. As in the case of Hall-Lew's (2004) Anglos, one type of fronted /u/ sounds monophthongal while the other sounds diphthongal. To see what makes them sound this way, consider two representative speakers' /u/ in *do*, shown in Figures 1 and 2.

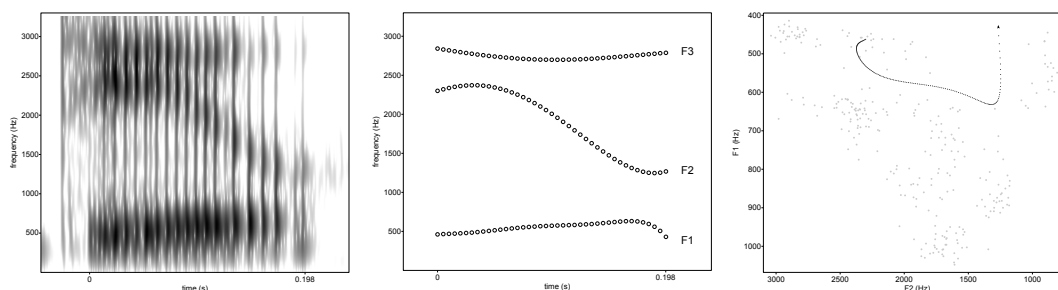


Figure 1: Utterance-final *do*, 19-year-old female Houston Anglo speaker.

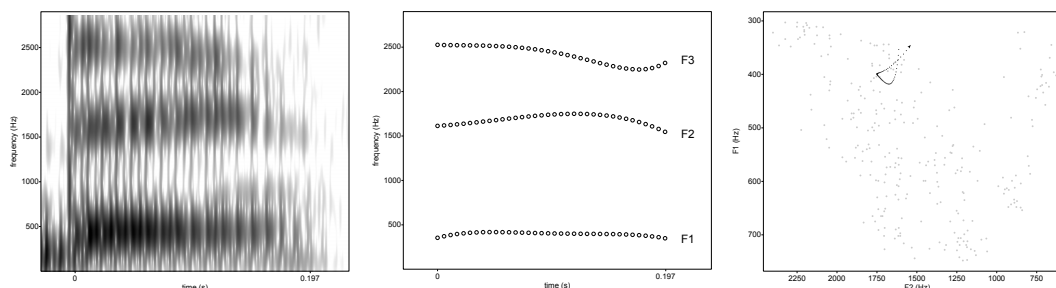


Figure 2: Utterance-final *do*, 45-year-old male Houston Anglo speaker.

Both speakers read the word *do* as part of the sentence *I bet your cat gets more attention than I do* in a reading passage. In Figures 1 and 2, the left panel shows a spectrogram of each speaker's production, the second panel repeats the corresponding F1, F2, and F3 contours, and the third panel shows the F1-by-F2 trajectory, or vowel 'gesture', superimposed on each speaker's vowel space. The direction of movement is shown by a small arrow at the vowel offset.

In comparing Figures 1 and 2, note that the younger speaker's F2 peak occurs early in the vowel and is followed by a long backward gesture which reaches a much lower target frequency. By contrast, the older speaker's second formant shows a gradual rise to a late peak, followed by a much more limited backward gesture. The late F2 peak shows that the vowel is forward gliding for a significant portion of its duration. Regarding vowel height, note that the older speaker's first formant has an early peak and then falls. The younger speaker's /u/ lacks such an early F1 peak. F1 starts out low, keeps rising, and peaks only at the very end. These opposed F1 trajectories are clearly seen in the F1-by-F2 plots. Note the younger speaker's low glide target. The vowel ends in a high-mid back quality close to [ɔ]. As for the third formant, note that the dip in F3 occurs later in the older speaker's /u/. Overall, the F2 trajectory seems to contribute most to the auditory contrast. The older speaker's limited F2 movement makes his /u/ sound practically monophthongal.

Other vowel variables, not illustrated here, show that the two speakers in Figures 1 and 2 fall on opposite ends of the spectrum from linguistically Southern to linguistically non-Southern Anglo speech in Houston. That is, irrespective of the quality of their /u/, their vowel systems epitomize the shift away from Houston's Southern linguistic legacy. The repeated observation of such cases of co-variation between the presence or absence of Southern vowel variants and one type of /u/ or the other gives rise to the hypothesis that in Houston the more monophthongal /u/ (Figure 2) is used by those speakers who participate more fully in Southern phonology, while the more diphthongal /u/ (Figure 1) is used by those who show few or no Southern phonological features.

To test this hypothesis, F1, F2, and F3 trajectories of /u/ were extracted from all words containing /u/ in wordlist recordings of twenty Anglo Houstonians. These 20 speakers were selected from a larger sample of 42 recently recorded Anglos whose vowel spaces had been previously analyzed. The subsample was designed to include the 10 most Southern and the 10 least Southern speakers, linguistically speaking. This was determined on the basis of a compound Southern Vowel Shift index, composed in equal measures of six continuous variables: lowering of /e/ and /i/, raising of /æ/, /ɛ/ and /ɪ/, and weakening of the /aɪ/ offglide. Note that this index is independent of /u/ or other back vowels. It includes only vowel shifts which are unambiguously Southern in the context of Houston Anglo speech. The first group contains four female and six male speakers (mean age 54). The second group contains eight female and two male speakers (mean age 19). In the following, I will refer to them as the SOUTHERN and the NON-SOUTHERN group, respectively.

Formant frequencies were extracted at 100 equidistant steps through each vowel using Praat's LPC formant tracker. LPC parameters were adjusted to obtain the best fit to visually identifiable formant locations. Then, an interactive Praat Editor script was used to model the formant tracks as complex polynomial equations with up to nine coefficients, depending on the complexity of the contour. This was done in order to reduce the number of values to be stored, as well as to achieve a certain degree of smoothing, as in Smoothing Spline ANOVA approaches to formant contours (e.g., Baker 2006, Nycz and De Decker 2006). The large number of up to 9 coefficients was cho-

sen to preserve as much temporal detail as possible. Other authors have found that even lower-order polynomials provide reliable fits to formant contours (e.g., McDougall and Nolan 2007).

Vowel duration measurements were also taken and compared. The SOUTHERN group's mean /u/-durations were significantly longer than the NON-SOUTHERN group's, both in closed and in open, word-final syllables. However, it is unclear to what extent this reflects a dialect difference and to what extent it reflects the effect of aging on speaking rate, resulting in longer segment durations. Note the large difference in the mean age of the groups. Because of this ambiguity, I will not discuss the issue of total duration further here.

3.3 Word-final /u/

The group comparison of formant contours is shown in Figure 3 for two /u/-final words, *Sue* and *stew*. Where the confidence intervals don't overlap, the difference is statistically significant.²

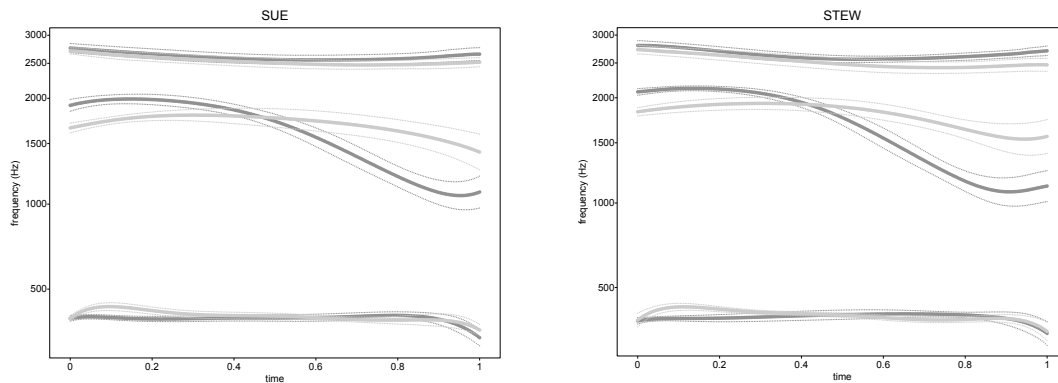


Figure 3: Time-normalized mean F1, F2 and F3 trajectories with 95% confidence intervals for /u/ in *Sue* and *stew*. Formant frequencies Nearey-1 normalized. Bark-scaled to better bring out the differences in F1. Dark gray = NON-SOUTHERN group; Light gray = SOUTHERN group.

Figure 3 shows that the points of difference noted above in the discussion of Figures 1 and 2 are generally characteristic of the two groups, although they are not always as pronounced. The other /u/-final words in the wordlist (e.g., *two*, *do*) show the same contrasts, with the difference near the F2 offset being the most consistent.

There is, then, reliable acoustic evidence of two distinct types of fronted /u/ in Houston Anglos. One type is associated with Southern speech while the other forms part of a non-Southern style. This raises the question: How well do they match prior phonetic descriptions of fronted /u/, specifically descriptions of /u/-fronting in the South and /u/-fronting beyond the South?

The NON-SOUTHERN group's /u/ strongly echoes the type of fronted /u/ reported widely outside of the South (see Section 2). The F2 trajectory shows the characteristic fronting of the vowel nucleus, provided by the F2 peak, while the offglide target remains near the back of the vowel space. Based on the present data, two observations can be added to previous descriptions of this type. First, there is no early F1 peak, i.e., no initial opening gesture. Quite the opposite: F1 starts low, sometimes even shows a subtle dip near the onset, and then rises slightly toward the vowel end. Thus, in articulatory terms, this type of /u/ is not upgliding but, arguably, downgliding. Second, the temporal ratio of nucleus and glide is almost one-to-one. Nucleus fronting appears to go along with nucleus lengthening. This likely contributes to the tendency for the offglide to be assimilated to following consonants because a shorter offglide is more vulnerable to coarticulation.

The case of the SOUTHERN group's /u/ requires more discussion. To begin, how is this type best analyzed in terms of articulatory targets? It appears to contain not two but three targets: one at the F1 peak, a second at the F2 peak, and a third at the F2 minimum. The direction of F1 movement shows that this type preserves /u/'s original, upgliding orientation. Hence, the F1 peak near

²The confidence intervals were calculated as: (standard deviation/ $N^{0.5}$)*1.96

the onset indicates the vowel nucleus, conventionally defined as the articulatorily lowest point in upgliding vowels. The SOUTHERN group's /u/ also preserves /u/'s original, asymmetric nucleus-glide ratio. The F1 excursion is much shorter than the rest of the vowel. Having identified the F1 peak as the vowel nucleus, the F2 peak must indicate an offglide target. Several aspects of the F2 trajectory support this interpretation. The second formant rises gradually, rather than rapidly, and peaks relatively late in the vowel. The F2 peak clearly follows the F1 peak. The F2 excursion is long in duration and includes a near-steady state. Its shape resembles the offglide trajectory of other upgliding vowels, though not perfectly (see below). Note the consequences of not analyzing the F2 peak as the nucleus. Doing so would make the vowel appear simply back-gliding, much like the NON-SOUTHERN group's /u/. But the similarity is misleading. The relative timing of the F2 peak shows that this type of /u/ is, in fact, initially front-gliding. In terms of the first two targets, then, the SOUTHERN group's /u/ resembles a front-gliding, Southern /u/ (see Section 2). It differs from contemporary rural Southern variants only in that the amount of forward movement is small. Also, there is no noticeable lowering of the nucleus.

The status of the apparent third target, indicated by the limited but consistent drop in F2 near the vowel offset, remains unclear. In word-final position, this gesture cannot easily be attributed to coarticulation with a following onset consonant. Recall that the trajectories were extracted from word list recordings. The speakers read the words one by one, as separate prosodic units. This decreases the likelihood of coarticulation across words. Equally unlikely is an explanation of the gesture as a return of the articulators to a neutral position. If this were the case, the F2 trajectory of, for example, /i/ should show a similar gesture in word-final position. But in the present data, the F2 of /i/ remains steady until the vowel offset. A third possibility is that the falling F2 reflects /u/'s rounding gesture, as argued by Thomas (2001:34). However, if lip rounding is the cause, it is not clear why F3 does not drop simultaneously with F2 (see below for more on F3). The F2 and F3 trajectories are not particularly well aligned. Yet another interpretation is that the final F2 gesture, regardless of its articulatory basis, reflects an overt correction on the part of the speakers toward a less Southern sounding /u/. Indeed, the falling F2 partially assimilates the SOUTHERN group's /u/ to the NON-SOUTHERN group's /u/. Whatever its motivation may be, analyzing the falling F2 near the offset as an intrinsic part of the vowel amounts to positing a secondary offglide target. This makes this type of /u/ triphthongal. Ironically, then, even though the SOUTHERN group's /u/ sounds more monophthongal overall, a close analysis reveals a triphthong.³

To finish up the discussion of acoustic differences between the two types of fronted /u/, what is the relevance of the temporally delayed and slightly more pronounced dip in the SOUTHERN group's F3? The lower F3 target may indicate greater lip rounding in this variant, given that lip protrusion lengthens the oral cavity, and a lengthened vocal tract lowers all oral formants. If this is the case, the weaker rounding in the NON-SOUTHERN group's /u/ may be taken as acoustic evidence of unrounding. Recall that some authors have argued that /u/-fronting in non-Southern speakers goes along with a loss of lip rounding (see Section 2). I would argue, however, that the subtle difference in F3 is unlikely to cause the impression of a lack of rounding in one type of fronted /u/ but not in the other. Note that it occurs at the *end* of the vowel, while previous accounts have reported unrounded *onsets*, e.g., [ɪʊ]. Rather, I believe that the auditory impression of a lack of initial rounding in the fronted /u/ of non-Southern speakers is actually a perceptual illusion brought about by the diphthongal F2 trajectory. This trajectory makes it easy to perceptually separate the vowel into a front part and a back part. In this situation, the existing rounding is naturally attributed to the back part, the offglide, and perceptually subtracted from the front part, because in English rounding only exists in back vowels. Thus, even though nucleus and glide may both be rounded, the rounding of the onset is not heard.⁴ In the case of the Southern fronted /u/, the perception of rounding cannot be selectively attributed to one part of the vowel because this type has no back component. As a result, it is heard as rounded throughout.

³Habick (1991:204) describes a triphthongal variant but notes that it is not common. I suspect that the Southern fronted /u/ is more often triphthongal than is generally acknowledged. The problem may be that the first and/or third targets are often subtle or masked by coarticulation.

⁴An analogous case is the misperception of a nasal vowel as a sequence of an oral vowel and a nasal consonant because there are no nasal vowels in English.

3.4 /u/ before Coronal Consonants

Figure 4 shows the group comparison of formant contours in words where /u/ precedes a coronal consonant. In this environment the contrast in F2 can be minimal or completely camouflaged.

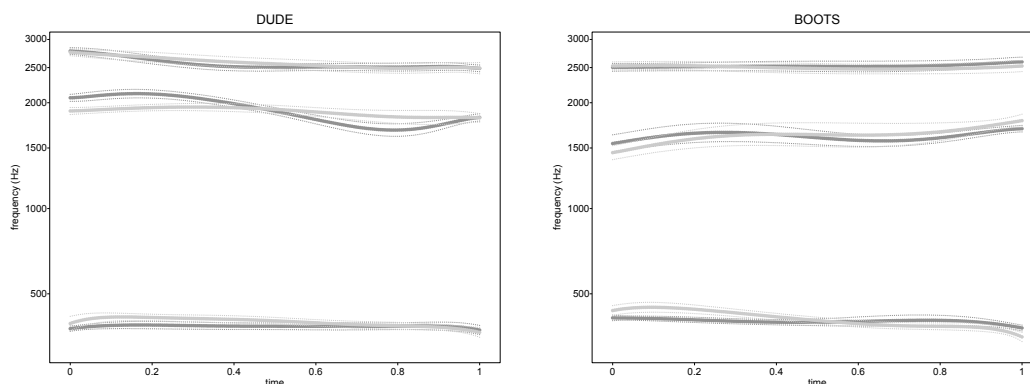


Figure 4: Mean F1-F3 trajectories in *dude* and *boots*. Presentation as in Figure 3.

The words shown in Figure 4 illustrate the effect of a following /d/ and /t/. These consonants' high F2 locus 'deletes' the backglide of the NON-SOUTHERN group's /u/, rendering it near-homophonous with the SOUTHERN group's /u/. I touched on this effect in Section 2 in the discussion of a stereotypical white California pronunciation of *dude*, which also lacks a backglide (Eckert 2008). The F2 trajectory of the NON-SOUTHERN group's /u/ in *dude* actually still shows a slight forward-backward gesture, while the SOUTHERN group's F2 is completely flat, as expected from an offglide steady state. Still, the difference is extremely subtle. It does not exist at all in *boots*, presumably because of /u/'s shorter duration before the voiceless stop.

Figure 4 also illustrates coarticulatory neutralization of the F2 contrast near the onset. In *boots* (as well as *food*, not shown here), the characteristic late-rising F2 of the SOUTHERN group is masked by the labial F2 transition, which is itself low. This results in virtually identical F2 trajectories for both groups. Thus, words like *boots* provide no evidence of the contrast in F2 at all.

4 Discussion and Conclusion

The acoustic data discussed in this paper make it clear that Houston Anglos are using two different kinds of fronted /u/. The two differ in a number of fine phonetic details, some of which are more evident in some linguistic contexts than in others. Moreover, the two types found in Houston clearly echo the properties of fronted /u/ variants reported independently in studies of Southern speakers, in one case, and non-Southern speakers, in the other case. Taken together with the insights provided by prior descriptions, especially Hall-Lew's (2004) findings in Flagstaff, these data make it possible to distinguish two general outcomes of /u/-fronting in North America: (i) a *Southern* fronted /u/, and (ii) a *mainstream* fronted /u/.⁵

This leads back to the main question of this paper: Can the supra-regional, mainstream fronted /u/ be considered an extension of the Southern fronted /u/? Or are they the result of independent shifts that share the same name because they have superficially similar effects? In a recent discussion of the origins of /u/-fronting, Labov (2008:27) proposes the following sequence of changes.

$$(1) \quad [u^u] \rightarrow [\mathfrak{u}^u] \rightarrow [y^u] \rightarrow \begin{matrix} [y^y] \rightarrow [y] \\ \searrow \\ [i^u] \end{matrix}$$

⁵I prefer the term *mainstream* to the negative *non-Southern*, not only because this type is the more widespread one, but because it appears to be associated with overt prestige and perhaps standard language, given that /u/-fronting of this type is led by women and higher SES groups (see Baranowski's 2008 review).

According to (1), /u/ first undergoes maximal diphthongization to [y^u] while remaining rounded throughout. Then a split occurs, and either the offglide assimilates to the nucleus, leading to monophthongal [y], or the fronted nucleus unrounds, leading to the even more differentiated [ɪ^u]. Labov (2008) does not explicitly identify the main branch, ending in [y], as what happened in Southern dialects, and the side branch, ending in [ɪ^u], as what happened outside of the South. However, for the sake of the argument I interpret them in that way here. Note that (1) does not claim that [ɪ^u], or what I have called the mainstream fronted /u/, derives directly from [y], the Southern fronted /u/. Instead, both share a common Southern ancestor, [y^u]. If the split in (1) represents the time point in the mid-20th century when, in Thomas' (2001:33) words, /u/-fronting "spilled out of the South," Labov's scenario is a version of Thomas' continuity hypothesis.

In the light of the phonetic evidence discussed in Sections 2 and 3, however, I prefer the scenario in (2), which recognizes two independent fronting processes from the beginning.⁶

- (2) a. [u] → [ɰ] → [y] (in the South)
 b. [u] → [ɪ^u] → [ɪ^u] (in other /u/-fronting areas of North America)

The key difference between the (a)-type and the (b)-type of /u/-fronting is that in (2a) the degree of nucleus-glide differentiation remains constant and small. In the South, /u/ fronts as a whole. Nucleus and glide remain close together, or in fact coincide completely in the front-back dimension (see below on nucleus lowering). The process in (2b), on the other hand, involves ever greater diphthongization.⁷ My reason for preferring (2) over (1), apart from the theoretical problems pointed out in the introduction, is that it is simpler to assume that in the South /u/ retained its quasi-monophthongal character throughout the fronting process. To claim that /u/ first fully diphthongized to [y^u] and then turned back into a monophthong seems somewhat arbitrary. The scenario in (2) does not require such a monophthongization process. Also, this scenario may be more historically accurate. Note that positing [y^u] as the historical link conflicts with Kurath's (1964) observation that the variants [ɰ: ~ ɰɰ] were the most widespread in the South around mid-century.

Finally, how does the lowering of the nucleus of /u/ in the South, discussed in Section 2, fit into this picture? I interpret it as an independently motivated phenomenon. Nucleus lowering in /u/ follows a general Southern Vowel Shift pattern in which all non-low upgliding vowels, especially /eɪ/ but in advanced speakers also /i/ and /o/, increase the extent of their upglide trajectories. This explains why not all Southerners show much lowering of /u/. One would expect it only in Labov et al.'s (2006) Stage 3 Southern Shift speakers, i.e., in those who have generalized nucleus lowering to high vowels. This also explains the lack of lowered /u/ in Houston, given that /i/-lowering is minimal here as well. Moreover, the view of lowering as independent of fronting is supported by Bailey's (1997) chronology of Southern American English in which /u/-fronting actually preceded the Southern Vowel Shift, if not by much.

5 Further Implications

5.1 /u/ in the Urban South

I believe that sociophonetic studies of the urban South may benefit from distinguishing the two types of fronted /u/ discussed in this paper. Rather than measuring /u/-fronting per se, it may be more interesting to use the Southern and the mainstream type as the dependent variable for Anglo speakers. Especially in smaller Southern cities the two types may be competing more vigorously, even in younger speakers, than in Houston. For example, Thomas (2001:124) describes a speaker from Raleigh, North Carolina, born in 1982, whose /u/ is front-gliding. One might also expect the two types to be used selectively in style shifting, as in Johnstone's (1999) study of Texas women. While I think that taking this perspective is potentially revealing, it is not guaranteed that both

⁶My use of [u] as the initial quality is meant to bring out the continuity from [u] to [y] in (2a), not to deny that non-fronted /u/ may have been minimally diphthongal. That is, [u] in (2) is equivalent to [u^u] in (1).

⁷Strong downward glides like that in Figure 1 suggest that [ɪ^u] may diphthongize further to [ɪ^o].

types will be found in a given locale. Recent studies of back vowel fronting in Memphis (Fridland and Bartlett 2006) and Charleston (Baranowski 2008) have not reported differences like those documented here. Anglos in Charleston, a marginally Southern city (Baranowski 2007), seem to be using the mainstream type (Baranowski, p.c.). In Memphis, where the presence of Southern features is relatively strong (Fridland 1999), it may be the mainstream type that is absent. Still, I doubt that Houston is the only Southern city where both types can be heard.

How, then, are the two types best distinguished in practical terms? One useful criterion may be the presence or absence of an early F1 peak. The Southern /u/ exhibits such a peak, while the mainstream fronted /u/ does not. One might also measure the temporal extent of the high F2 excursion. In a Southern /u/, it reaches further into the vowel. For example, at a fixed time point late in the vowel, say, four fifths of the way through, a Southern /u/ will have a higher F2.

What is clear is that the standard acoustic approach to /u/-fronting, which ignores the timing of gestures and relies simply on a measurement at the F2 peak (or, the center of the F2 steady state) cannot distinguish them. In fact, this approach works well only for the mainstream type where F2 peak and vowel nucleus can always be equated. In the Southern type, however, the nucleus is provided by the F1 peak and is independent of the F2 excursion, which in fact indicates an offglide (see Section 3.3). Thus, in many cases the standard F2-based approach would lead one to measure the fronting of the offglide, not the nucleus. Given that nucleus and glide fronting are strongly correlated in the Southern /u/, measuring the glide instead of the nucleus may cause no major problems. But it may still obscure the results.⁸

5.2 The Perception of /u/-fronting

Perception studies designed to reveal how /u/-fronting is socially evaluated may also benefit from incorporating the contrast between the two types discussed in this paper. Previous studies (Fridland et al. 2004, Torbert 2004) have found contradictory effects. Fridland et al.'s listeners did not clearly identify a fronted /u/ as more Southern. This may have been because in their stimulus words, *boot* and *duke*, the phonetic contrast between the Southern and the mainstream type of fronted /u/ was reduced or non-existent. Both *boot* and *duke* end in a consonant with a high F2 transition (see Section 3.4). A less ambiguous stimulus word would be one with /u/ in word-final position where a backglide remains unaffected. Torbert's (2004) non-Southern listener group accurately identified Southern speakers with advanced /u/-fronting as Southern. Although few details are provided about the stimuli, they apparently included multiple words containing /u/ spoken by Southerners and thus may have been representative of the Southern type.

5.3 Other 'Shared' Shifts

Besides /u/-fronting, several other ongoing vowel shifts in North America are sometimes described as "Southern" even though they are also found outside of the South, for example /o/-fronting and /u/-fronting. A closer look at the variants involved may reveal independent processes here as well. This may be especially interesting where, as in Houston, different versions of "the same" shift are found in the same community.⁹ For /o/, Thomas (2001:31) summarizes multiple types of fronting, with clear parallels to /u/ regarding the offglide. In general, it seems that in cases of such "shared" shifts, often one type has received closer phonetic attention in the literature than the other. This makes it difficult to evaluate their similarities and differences, and, at the same time, makes it tempting to conflate them under a general category label such as "fronting."

⁸This measurement approach provides an explanation for Labov et al.'s (2006:153) finding that coronal onsets have only a weak effect on the F2 of /u/ in Southern speakers, and that it is instead word-final position that predicts a high F2. A preceding consonant affects /u/'s offglide less than it affects its nucleus because the offglide occurs later. On the other hand, a coda consonant directly affects the offglide. In the absence of such a coda consonant, i.e. in word-final position, the /u/ offglide can always reach a high F2 frequency.

⁹Barbara Johnstone (p.c.) suggests that fronted /o/ in Pittsburgh may reflect two distinct shifts.

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